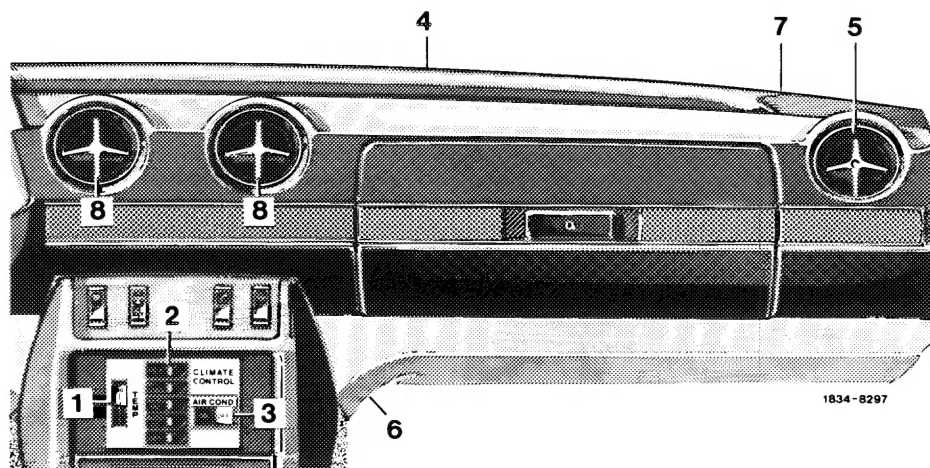


A. General



- |  |                                    |                             |
|--|------------------------------------|-----------------------------|
| 1 Temperature dial                       | 4 Air outlet from defroster nozzle | 7 In-car temperature sensor |
| 2 Pushbutton switch                      | 5 Lateral ventilation              | 8 Cooling air outlet center |
| 3 "ON/OFF" switch refrigerant compressor | 6 Air outlet in legroom            |                             |

The automatic climate control system is provided with an automatic temperature control, by means of which a given temperature between 18 °C to approx. 30 °C (64 °F to 86 °F) can be set, which will then be maintained automatically and independent of changes in outside temperature.

Apart from the automatic control which is covered in detail below, the basic components of the heating and air conditioning system are similar to those described in repair instructions air conditioning system I.

The automatic climate control system comprises the following main components:

Control unit (with temperature dial, pushbutton switch and "ON/OFF" switch for refrigerant compressor)

In-car and ambient temperature sensor

Amplifier

Regulating valve

Electrical and vacuum system for controlling entire installation

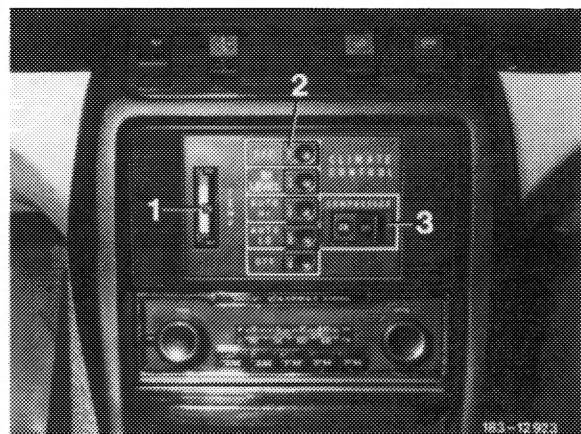
Temperature control

## B. Control unit

The control unit is located in dome and comprises a temperature dial (1), a pushbutton switch (2) and the refrigerant compressor "ON/OFF" switch (3). The temperature dial (1) serves to adjust vehicle inside temperatures from 18 °C to approx. 30 °C (approx. 64 °F to 86 °F).

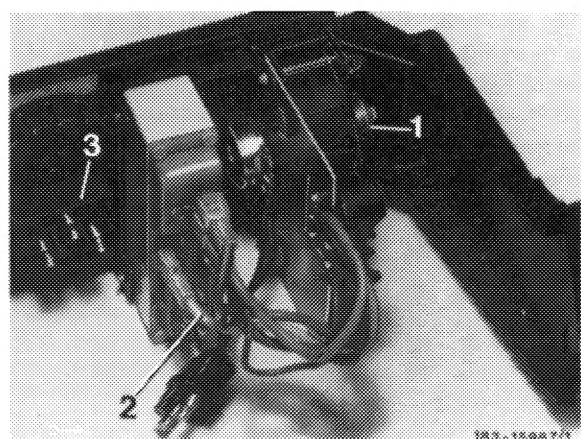
### Layout of control unit

- 1 Temperature dial
- 2 Pushbutton switch
- 3 "ON/OFF" switch of refrigerant compressor



The temperature dial carries 5 numerals (65 — 70 — 75 — 80 — 85) to set the desired temperature. Turning of temperature dial will adjust a resistance potentiometer. Together with the inside and outside temperature sensor (in-car and ambient temperature sensor) the potentiometer provides the desired value for temperature control.

- 1 Temperature dial with potentiometer
- 2 Pushbutton switch
- 3 "ON/OFF" switch of refrigerant compressor



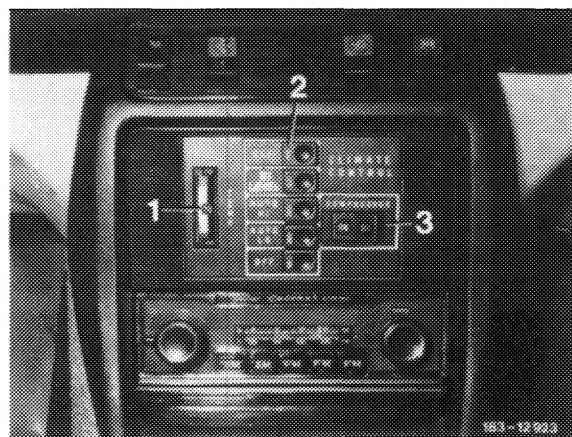
The pushbutton switch (2) is a component of the control unit (controller) and comprises 5 push-buttons:

**OFF** — Blower switched off, no fresh air input.

The electronic system continues to operate while driving and the regulating valve remains in operating position. The fresh air flap in blower housing is closed and the refrigerant compressor is inoperative.

**AUTO-LO** — for normal driving.

In cooling range the system operates with 5 blower stages, in heating range with 4 stages. The max. blower speed in cooling range is higher than the max. blower speed in heating range. The temperature is held to preselected level. In heating range, the heating begins to operate only when the coolant has attained 40 °C (approx. 104 °F). The main air flap will open only then and the blower will be switched on. In cooling range, the blower will usually start immediately.



In heating range, tempered air will flow out of legroom jets, with a leak air share from defroster jets. In cooling range, cool air will come out of center jets and lateral jets. The defroster and legroom jets are closed. The changeover is automatic. In addition, tempered air will always come out of the lateral venting jets. Closing and opening of the jets is always manually.

**AUTO-HI** — with higher blower output.

Operation similar to "AUTO-LO", but with higher blower stages. In cooling range, the system operates with 3 stages, in heating range with 2 stages.

This kind of adjustment permits:

1. Maintaining a pleasant temperature also in city traffic, when the air supply decreases due to a lower driving speed.
2. Providing enough fresh air for passengers on rear seats also under extreme temperature conditions.
3. Fast evacuation of cigarette smoke.

#### **BI-LEVEL** — under fog conditions

The blower operates in the higher stages 1 and 2 and will start already at a coolant temperature below 40 °C (104 °F). When "heating", all the air will enter through defroster jets into legroom and through jets of lateral ventilation; when "cooling" through defroster jets into legroom, at center jets and jets of lateral ventilation, if they are open. The air is tempered in accordance with the setting of temperature dial and in-car temperature. This function serves the purpose of removing the fog from the windows. In addition, this mode is particularly recommended at low outside temperatures.

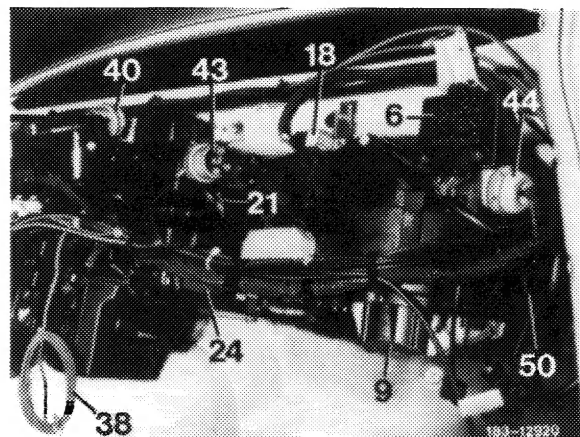
#### **DEF** — defrosting windows

The blower starts immediately and operates in higher 4th stage. Max. heated air flows out of defroster jets, independent of outside or inside temperature (ambient or in-car temperature) or adjustment of temperature dial (83—605).

**Note:** In position "DEF" the blower is immediately switched on independent of the vacuum directly via double contact relay (18), and in position "BI-LEVEL" by means of a vacuum circuit, without any consideration of coolant temperature. But if the coolant temperature below 40 °C (104 °F) the mode "BI-LEVEL", "AUTO-LO" or "AUTO-HI" is subsequently pushed, the blower remains engaged, since the main switch (19) is already activated by a vacuum. In such a case, the blower can only be switched off by way of the position "OFF" when the coolant temperature is above 40 °C (104 °F).

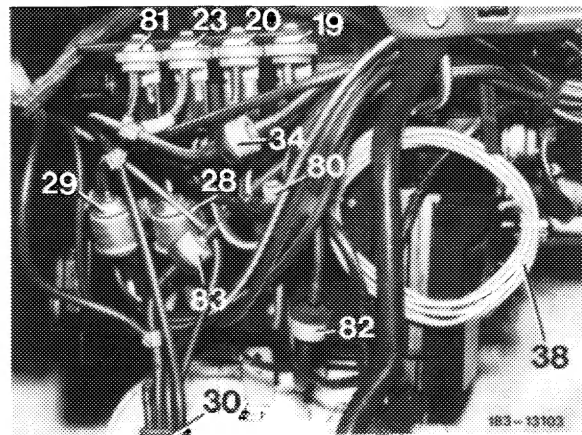
#### Layout of blower with amplifier

- |  |   |
|--|---|
| 6 Amplifier                                  | 40 Vacuum element center jet                      |
| 9 Blower                                     | 43 Vacuum element main air flap                   |
| 18 Double contact relay                      | 44 Vacuum element fresh air-recirculated air flap |
| 21 Temperature switch for heating water pump | 50 Air jet nozzle                                 |
| 38 Specified leak point                      |   |





- 19 Vacuum switch (main switch, green)
- 20 Vacuum switch (refrigerant compressor, yellow)
- 23 Vacuum switch for refrigerant compressor (at "BI-LEVEL" only)
- 28 Switchover valve legroom flaps
- 29 Switchover valve (fresh air-recirculated air flap)
- 34 Check valve
- 38 Specified leak point
- 80 Switchover valve "BI-LEVEL" (at "DEF")
- 81 Vacuum switch (at "BI-LEVEL" only)
- 82 Check valve
- 83 Check valve



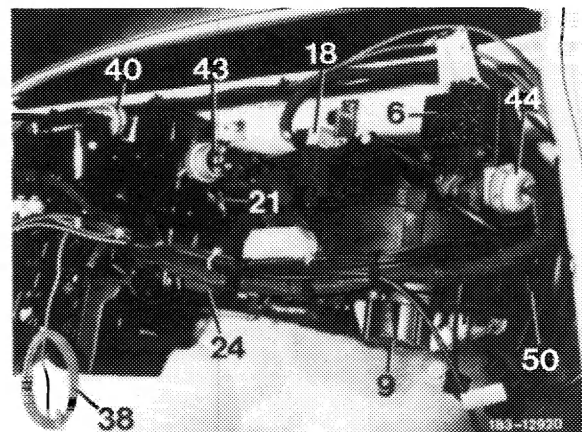
The main air flap (43) in evaporator housing has two positions:

During mode selection "OFF": no fresh air input.

In all operating stages: 100 % fresh air.

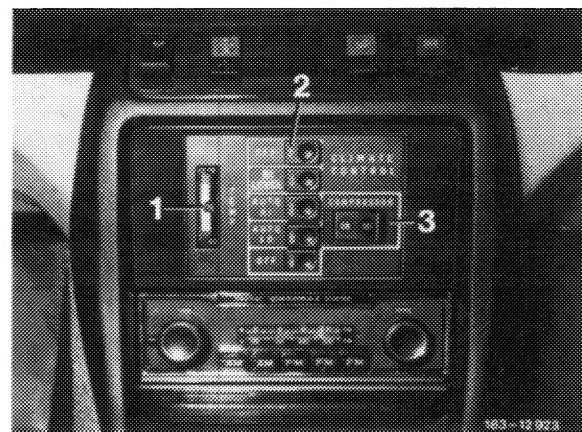
The fresh air-recirculated air flap (44) in evaporator housing has also two positions:

In all operating stages: 100 % fresh air, except during max. cooling: 20 % fresh air and 80 % recirculated air.

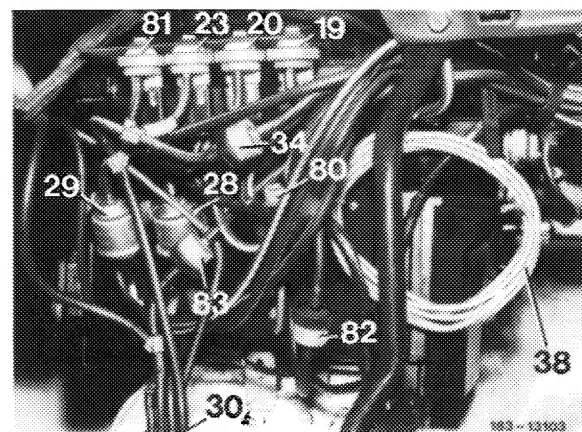


#### ON/OFF switch refrigerant compressor

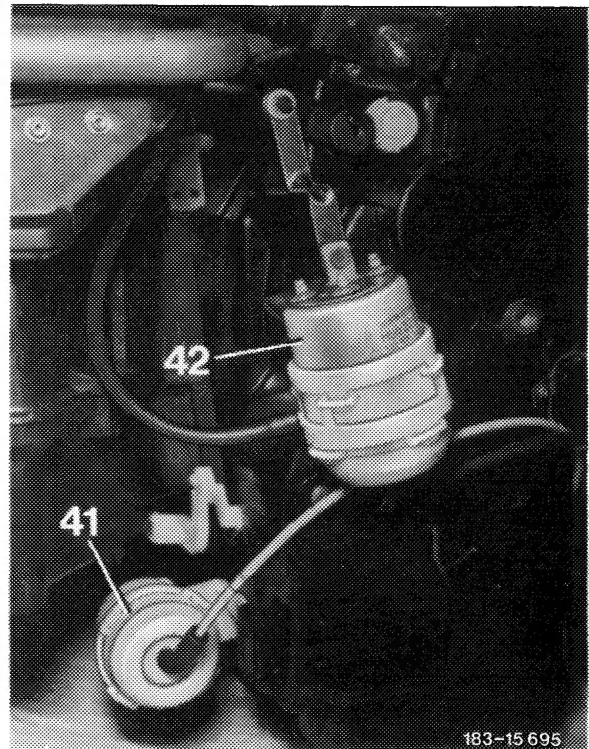
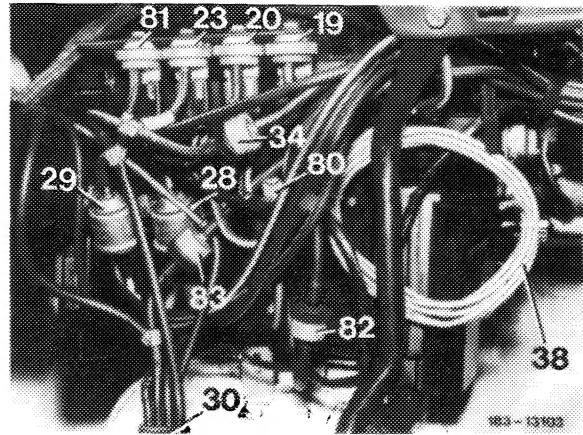
Since the refrigerant compressor is always operating at an ambient temperature above 2 °C (36 °F), the compressor can be completely switched off in positions "AUTO-LO" and "AUTO-HI"; e.g. to save fuel or if no cooling is desired. However, the refrigerant compressor will nevertheless run along in modes "BI-LEVEL" and "DEF" to support the effect of this mode by drying the air.



In position "OFF" of refrigerant compressor switch (3) and in range of max. cooling, the switchover valves (28 and 29) will open flap (44) in evaporator housing into position of 100 % fresh air, as well as flaps (41) for legroom in heater box.



- 19 Vacuum switch (main switch, green)
- 20 Vacuum switch (refrigerant compressor, yellow)
- 23 Vacuum switch for refrigerant compressor (at "BI-LEVEL" only)
- 28 Switchover valve legroom flaps
- 29 Switchover valve (fresh air-recirculated air flap)
- 34 Check valve
- 38 Specified leak point
- 80 Switchover valve "BI-LEVEL" (at "DEF")
- 81 Vacuum switch (at "BI-LEVEL" only)
- 82 Check valve
- 83 Check valve



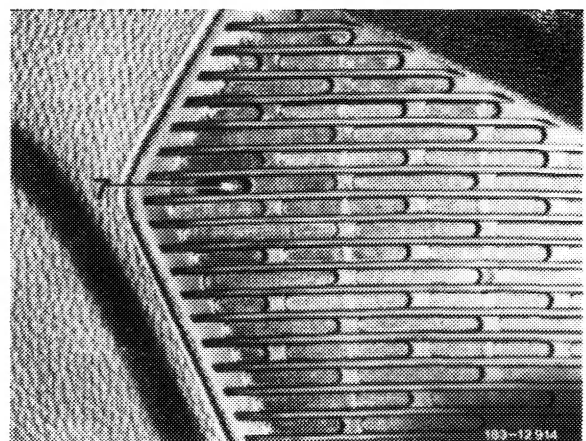
- 41 Vacuum element for legroom flaps (flaps open)
- 42 2-stage vacuum element for defroster jet flaps

### C. In-car and ambient temperature sensor

The in-car temperature sensor (7) is located in right-hand speaker cover in instrument panel. The sensor feels the in-car temperature and transmits that temperature to the amplifier (6) to balance the temperature as set.

Layout of in-car temperature sensor

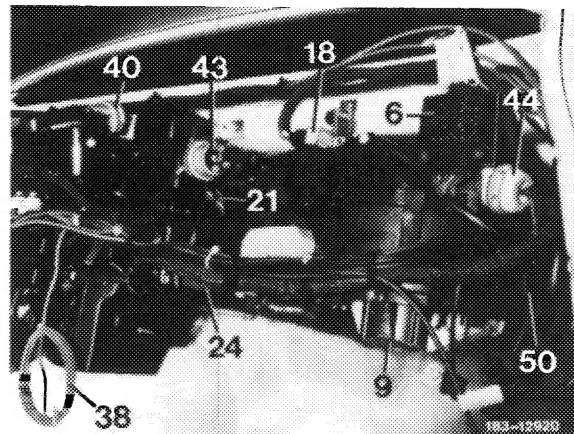
- 7 In-car temperature sensor



An air jet nozzle (50) attached to blower housing will draw air from interior of vehicle by way of the in-car temperature sensor while the blower is running. As a result, the response period of this sensor is shortened and the control accuracy is increased.

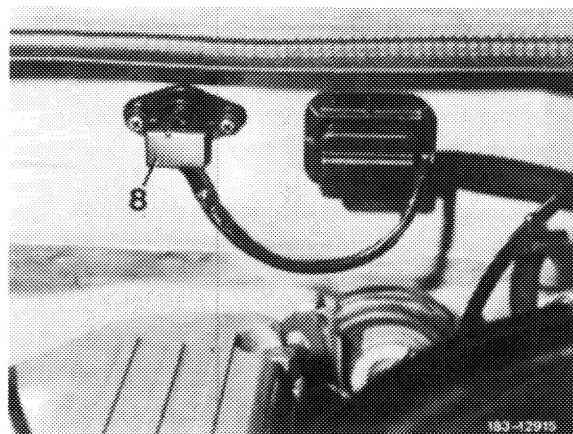
#### Layout of blower with amplifier

- |  |   |
|--|---|
| 6 Amplifier                                  | 40 Vacuum element center jet                      |
| 9 Blower                                     | 43 Vacuum element main air flap                   |
| 18 Double contact relay                      | 44 Vacuum element fresh air-recirculated air flap |
| 21 Temperature switch for heating water pump | 50 Air jet nozzle                                 |
| 38 Specified leak point                      |   |



The ambient air temperature sensor (8) for the drawn-in fresh air is located in air duct (water tank) in front of blower. With the blower running, the fresh air is constantly circulating around sensor, which in turn results in a short response period. Both sensors are temperature-sensitive resistors (thermistors) and are connected in series with potentiometer on temperature dial.

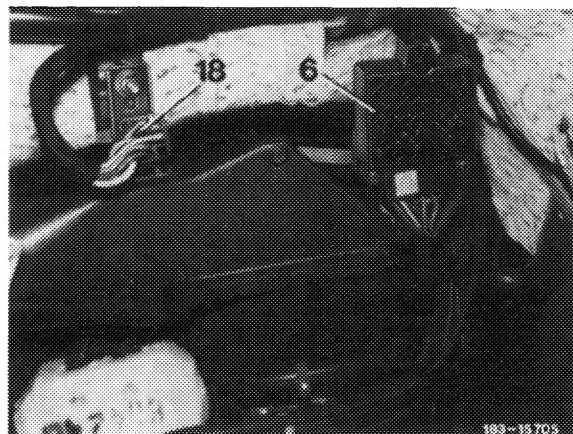
Layout of ambient air temperature sensor  
8 Ambient air temperature sensor



#### D. Amplifier

The amplifier (6) is attached to blower housing and compares the entire resistance of the chain: in-car temperature sensor, ambient temperature sensor, adjusting potentiometer and feedback potentiometer by means of a fixed resistor in amplifier.

- |                         |
|-------------------------|
| 6 Amplifier             |
| 18 Double contact relay |



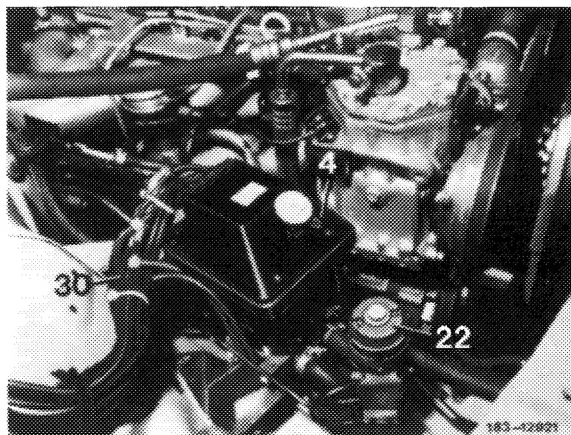
If the above are not in balance, a difference in potential will result which, in amplified condition, will drive the servomotor in regulating valve until both resistors are again in balance. With the ignition switched off, the amplifier will signal the regulating valve to move into "parking position" (second cooling stage) independent of the sensor temperatures and temperature adjustment. When the "DEF" button is pushed, the amplifier will signal the regulating valve to move into position for max. heating (higher 4th stage "DEF"), again independent of the temperature setting or the sensor temperatures.

## E. Regulating valve

The regulating valve (4) is driven by a gear motor and runs through the positions from max. heating to max. cooling, while adjusting a feedback potentiometer by means of which the amplifier (6) regulates the respective position. The following adjustments are made while running from heating to cooling:

Layout of regulating valve with heating water pump

- 4 Regulating valve
- 22 Heating water pump
- 30 Vacuum lines



- a) The water valve which controls the heating water flow from max. to 0.
- b) Sliding contacts for connection of pre-resistance group (10), for all blower stages.
- c) The vacuum valve, which controls the various flap positions of the air outlet jets and the flaps in evaporator housing.

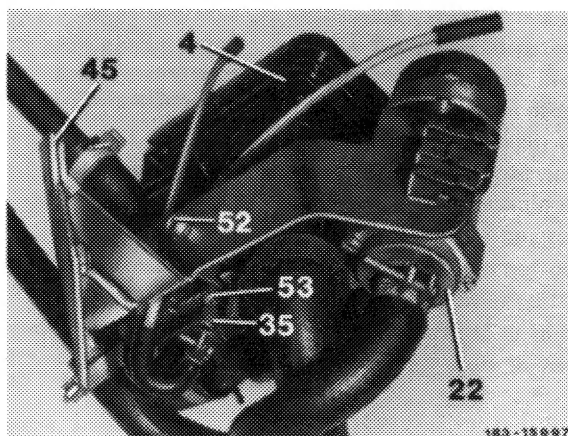
## F. Electrical and vacuum system for controlling entire installation

### a) Temperature switch for blower (cold engine lock)

This switch (35) is at bottom of regulating valve (4) and consists of a bimetallic vacuum switch. The switch releases vacuum starting at a coolant temperature of 40 °C (104 °F) or at an ambient temperature of above 20 °C (68 °F). In position "AUTO-LO" or "AUTO-HI" the blower will start only if one of the specified temperatures is attained. The temperature switch (35) can be individually replaced.  
(For section F, also refer to the following electric-wiring diagrams and vacuum function diagrams 83-600).

Layout of temperature switch in regulating valve

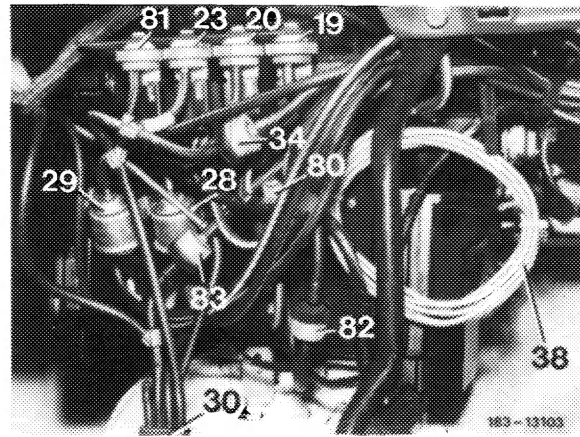
- 4 Regulating valve
- 22 Heating water pump
- 35 Temperature switch (water valve)





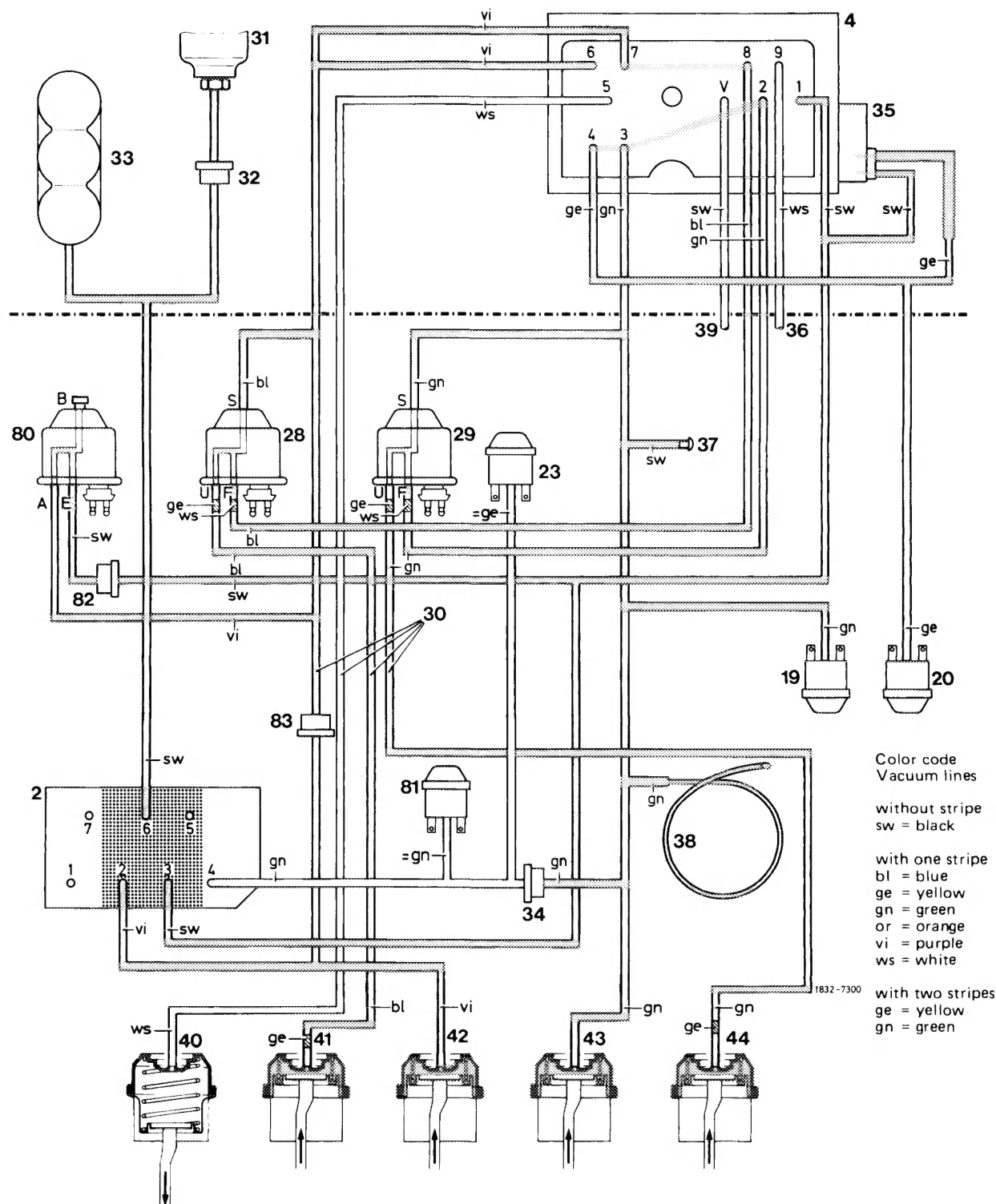
**b) Vacuum solenoid switch (main switch)**

This switch (19), color code green, is actuated by a vacuum. The vacuum arrives by way of temperature switch (35) and engages the blower, if set to "AUTO-LO" or "AUTO-HI" and a vacuum of more than 175 mbar (0.18 atu) is applied. In position "DEF" the blower is switched on directly via double contact relay (18) (also refer to the following electric wiring diagrams and vacuum function diagrams 83–600).



**c) Vacuum solenoid switch for refrigerant compressor**

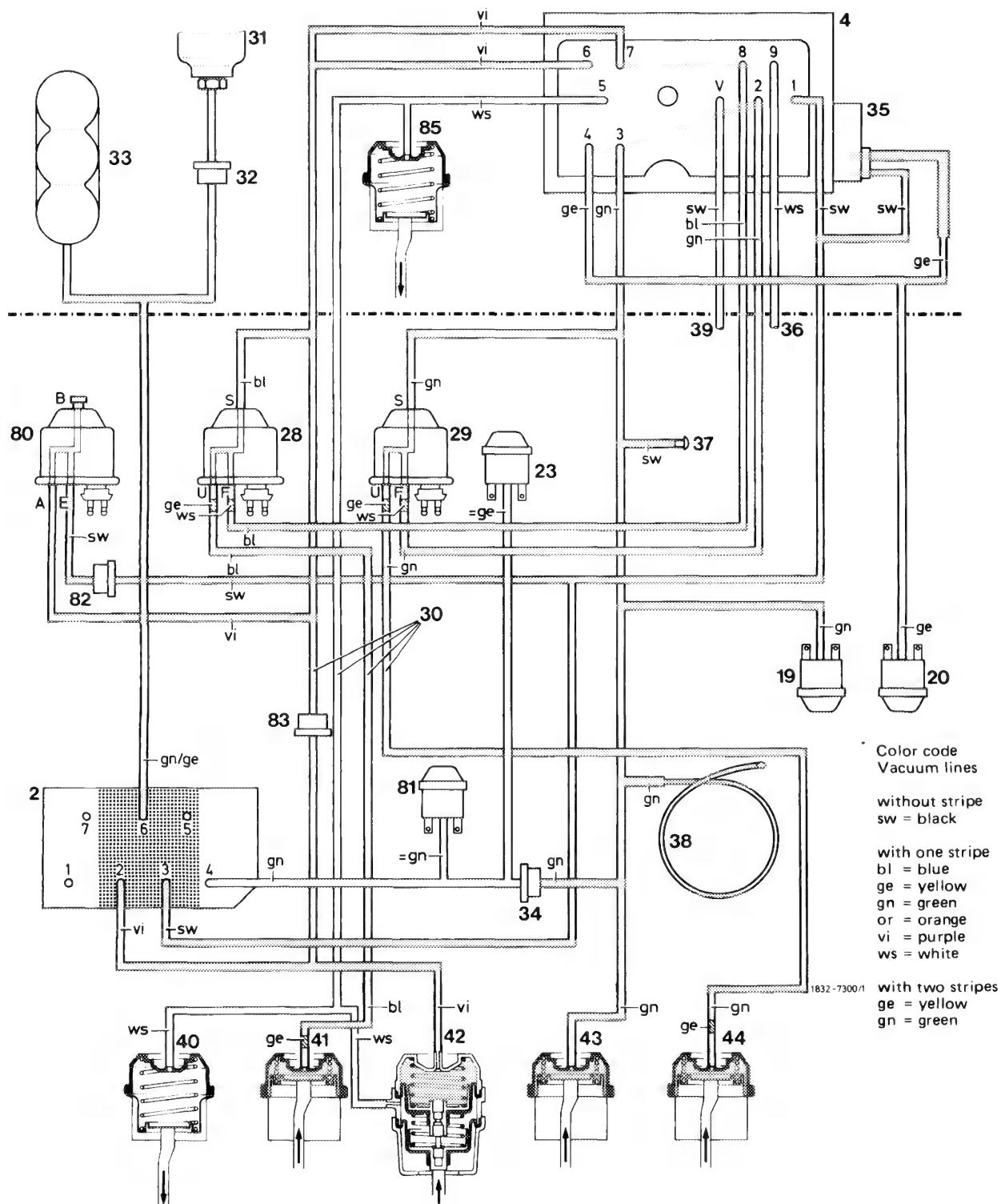
This switch (20), color code yellow, is also actuated by a vacuum. The vacuum is also supplied via temperature switch (35) and engages the refrigerant compressor if a vacuum of more than 78.5 mbar (0.08 atu) is available and if the pressure switch (25) and the ETR-switch (24) have an unobstructed passage (refer to 83–612).



Vacuum function diagram (version 1)

Pushbutton switch at "AUTO-LO" or "AUTO-HI", "ON/OFF" switch refrigerant compressor at "ON", regulating valve in position "heating", coolant temperature  $> 40^{\circ}\text{C}$  ( $> 104^{\circ}\text{F}$ )

- |   |  |   |
|---|--|---|
| 2 Pushbutton switch   | 32 Check valve                                     | 42 Vacuum element for defroster jets (flaps "closed") with leak air portion           |
| 4 Regulating valve  | 33 Vacuum reservoir                                | 43 Vacuum element for main air flap (flap "open")                                     |
| 19 Vacuum switch (main switch, green)                               | 34 Check valve                                     | 44 Vacuum element for fresh air-recirculating air flap (flap in position "fresh air") |
| 20 Vacuum switch (refrigerant compressor, yellow)                   | 35 Temperature switch                              | 80 Switchover valve "BI-LEVEL" (at "DEF")   |
| 23 Vacuum switch for refrigerant compressor (at "BI-LEVEL" only)    | 36 Vent line for legroom flaps                     | 81 Vacuum switch (at "BI-LEVEL" only)   |
| 28 Switchover valve (legroom flaps)                                 | 37 Vacuum connection for tester                    | 82 Check valve  |
| 29 Switchover valve (fresh air-recirculating air changeover switch) | 38 Specified leak point                            | 83 Check valve  |
| 30 Vacuum lines   | 39 Vent line for regulating valve                  |   |
| 31 Vacuum connection at intake pipe                                 | 40 Vacuum element for center jets (flap "closed")  |   |
|   | 41 Vacuum element for legroom flaps (flaps "open") |   |

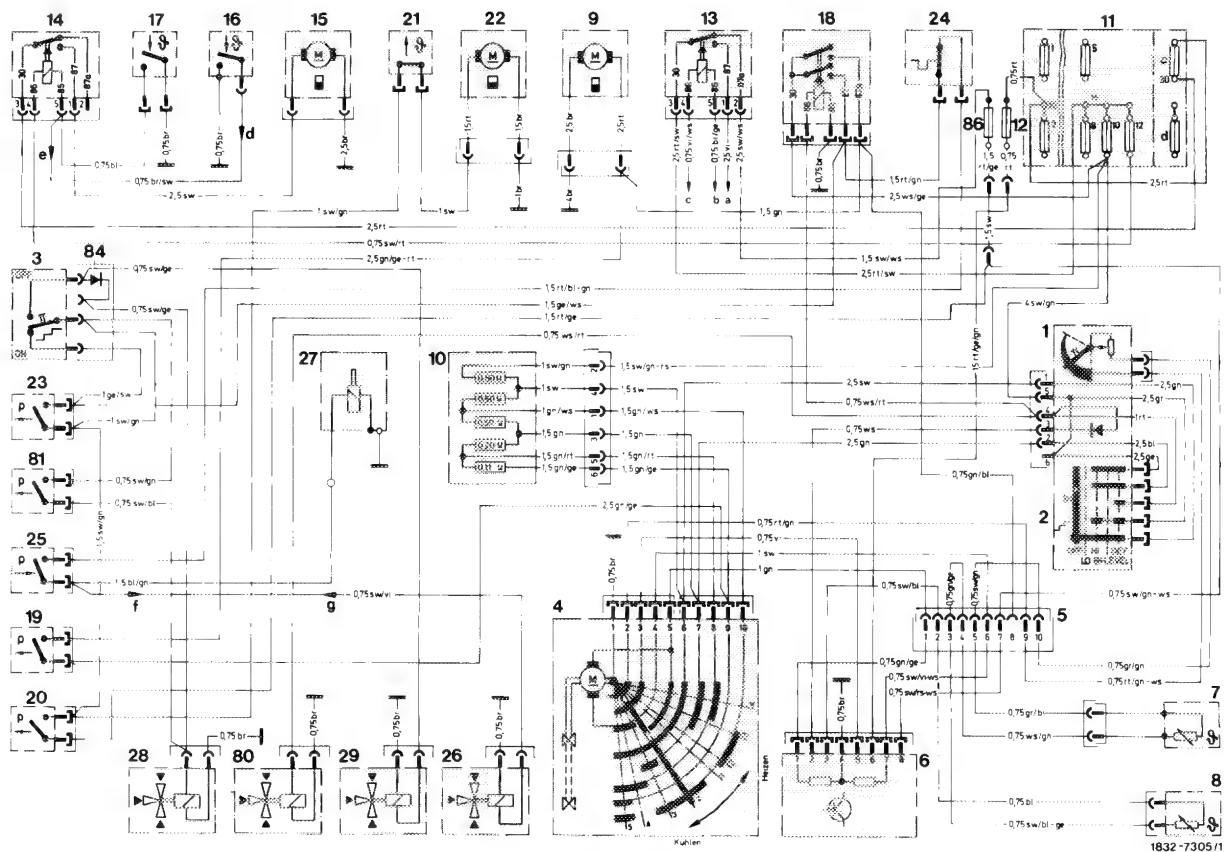


Vacuum function diagram (version 2)

Pushbutton switch at "AUTO-LO" or "AUTO-HI", "ON/OFF" switch refrigerant compressor at "ON", regulating valve in position "heating" coolant temperature  $> 40^{\circ}\text{C}$  ( $> 104^{\circ}\text{F}$ )

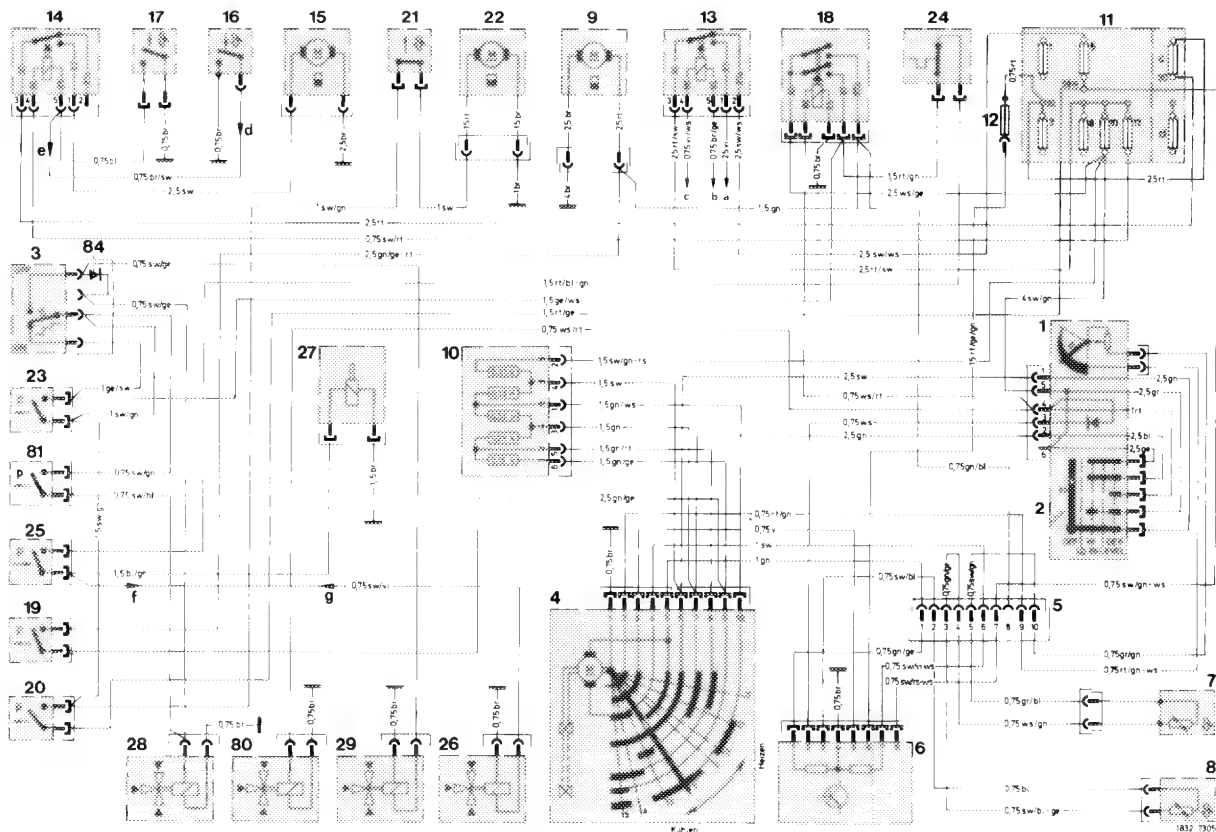
- |   |  |   |
|---|--|---|
| 2 Pushbutton switch   | 32 Check valve                                     | 42 Vacuum element for defroster jets (flaps "closed" with leak air portion)           |
| 4 Regulating valve  | 33 Vacuum reservoir                                | 43 Vacuum element for main air flap (flap "open")                                     |
| 19 Vacuum switch (main switch, green)                               | 34 Check valve                                     | 44 Vacuum element for fresh air-recirculating air flap (flap in position "fresh air") |
| 20 Vacuum switch (refrigerant compressor, yellow)                   | 35 Temperature switch                              | 80 Switchover valve "BI-LEVEL" (at "DEF")   |
| 23 Vacuum switch for refrigerant compressor (at "BI-LEVEL" only)    | 36 Vent line for legroom flaps                     | 81 Vacuum switch (at "BI-LEVEL" only)   |
| 28 Switchover valve (legroom flaps)                                 | 37 Vacuum connection for tester                    | 82 Check valve  |
| 29 Switchover valve (fresh air-recirculating air changeover switch) | 38 Specified leak point                            | 83 Check valve  |
| 30 Vacuum lines   | 39 Vent line for regulating valve                  | 85 Vacuum element for vent line (on vehicles with diesel engine only)                 |
| 31 Vacuum connection at intake pipe                                 | 40 Vacuum element for center jets (flap "closed")  |   |
|   | 41 Vacuum element for legroom flaps (flaps "open") |   |





Electric wiring diagram, ignition off, regulating valve in position "parking" (standard)

- |   |   |
|---|---|
| 1 Temperature dial  | 20 Vacuum switch (refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu)                         |
| 2 Pushbutton switch   | 21 Temperature switch for heating water pump (22)   |
| 3 "ON/OFF" switch refrigerant compressor  | 16 °C (61 °F) ON, 26 °C (79 °F) OFF   |
| 4 Regulating valve  | 22 Heating water pump   |
| 5 10-point plug connection for tester   | 23 Vacuum switch (for refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only) |
| 6 Amplifier   | 24 ETR-switch 2 °C (36 °F)  |
| 7 In-car temperature sensor   | 25 Pressure switch refrigerant compressor   |
| 8 Ambient temperature sensor  | ON 2.6 bar gauge pressure (2.6 atu)   |
| 9 Blower  | OFF 2.0 bar gauge pressure (2.0 atu)  |
| 10 Pre-resistance for blower  | 26 Switchover valve for constant speed (engine 110.984 only)  |
| 11 Main fuse box  | 27 Electromagnetic clutch for refrigerant compressor  |
| Fuse 10 : 16 amps   | 28 Switchover valve for vacuum element of legroom flaps   |
| Fuse 12 : 8 amps  | 29 Switchover valve for vacuum element of fresh air-recirculating air changeover switch                                 |
| Fuse C : 16 amps  | 30 Switchover valve "BI-LEVEL" (at "DEF")   |
| 12 Additional fuse for amplifier (2 amps)   | 31 Vacuum switch (closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only)                             |
| 13 Relay air conditioning system  | 32 Diode  |
| 14 Relay auxiliary fan  | 33 Additional fuse (5 amps) for heating water pump, refrigerant compressor and amplifier                                |
| 15 Auxiliary fan  | a Cable connector starter terminal 50   |
| 16 Temperature switch 100 °C (212 °F) in thermostat housing for auxiliary fan       | b Starter lockout and back-up lamp switch   |
| 17 Temperature switch 62 °C (142 °F) in receiver dehydrator for auxiliary fan       | c Ignition starter switch terminal 50   |
| 18 Double contact relay   |   |
| 19 Vacuum switch (main switch, closes with vacuum higher than 175 mbar or 0.18 atu) |   |

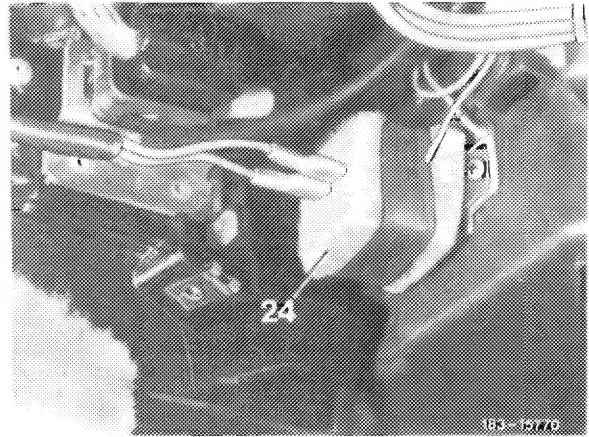


Electric wiring diagram (ignition off, regulating valve in position "parking") (USA)

- |   |   |
|---|---|
| 1 Temperature dial  | 20 Vacuum switch (refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu)                         |
| 2 Pushbutton switch   | 21 Temperature switch for heating water pump (22)   |
| 3 "ON/OFF" switch refrigerant compressor  | 16 °C (61 °F) ON, 26 °C (79 °F) OFF   |
| 4 Regulating valve  | 22 Heating water pump   |
| 5 10-point plug connection for tester   | 23 Vacuum switch (for refrigerant compressor, closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only) |
| 6 Amplifier   | 24 ETR-switch 2 °C (36 °F)  |
| 7 In-car temperature sensor   | 25 Pressure switch refrigerant compressor   |
| 8 Ambient temperature sensor  | ON 2.6 bar gauge pressure (2.6 atu)   |
| 9 Blower  | OFF 2.0 bar gauge pressure (2.0 atu)  |
| 10 Pre-resistance for blower  | 26 Switchover valve for constant speed (engine 110.984 only)  |
| 11 Main fuse box  | 27 Electromagnetic clutch for refrigerant compressor  |
| Fuse 5 : 8 amps   | 28 Switchover valve for vacuum element of legroom flaps   |
| Fuse 10 : 16 amps   | 29 Switchover valve for vacuum element of fresh air-recirculating air changeover switch                                 |
| Fuse 12 : 8 amps  | 80 Switchover valve "BI-LEVEL" (at "DEF")   |
| Fuse C : 16 amps  | 81 Vacuum switch (closes with vacuum higher than 78.5 mbar or 0.08 atu, at "BI-LEVEL" only)                             |
| 12 Additional fuse for amplifier (2 amps)   | 84 Diode  |
| 13 Relay air conditioning system  | a Cable connector starter terminal 50   |
| 14 Relay auxiliary fan  | b Starter lockout and back-up lamp switch   |
| 15 Auxiliary fan  | c Ignition starter switch terminal 50   |
| 16 Temperature switch 100 °C (212 °F) in thermostat housing for auxiliary fan       | d Via relay ignition switchover terminal 85   |
| 17 Temperature switch 62 °C (142 °F) in receiver dehydrator for auxiliary fan       | e Via relay decoupling terminal 30  |
| 18 Double contact relay   | f Via relay ignition switchover terminal 87a  |
| 19 Vacuum switch (main switch, closes with vacuum higher than 175 mbar or 0.18 atu) | g Via relay ignition switchover terminal 30   |
- engine  
110.984 only

#### d) ETR-switch (evaporator temperature regulator)

The ETR-switch (24) is attached laterally on evaporator housing. The capillary of the switch is between the ribs of evaporator. The switch interrupts the current flow to refrigerant compressor clutch as soon as the rib temperature is below  $2^{\circ}\text{C}$  ( $36^{\circ}\text{F}$ ). This will prevent any icing up of evaporator.

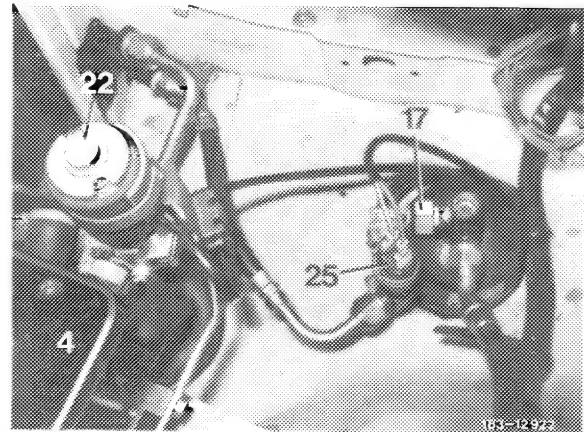


#### e) Pressure switch for refrigerant compressor

This switch (25) is located at receiver dehydrator of refrigerant circuit. When the refrigerant is not yet completely lost (high pressure too low) the pressure switch will switch off the electromagnetic clutch and thereby prevent damage to refrigerant compressor.

Layout of pressure switch and temperature switch in receiver dehydrator

- |    |                                      |    |  |
|----|--------------------------------------|----|--|
| 4  | Regulating valve                     | 22 | Heating water pump                         |
| 17 | Temperature switch for auxiliary fan | 25 | Pressure switch for refrigerant compressor |

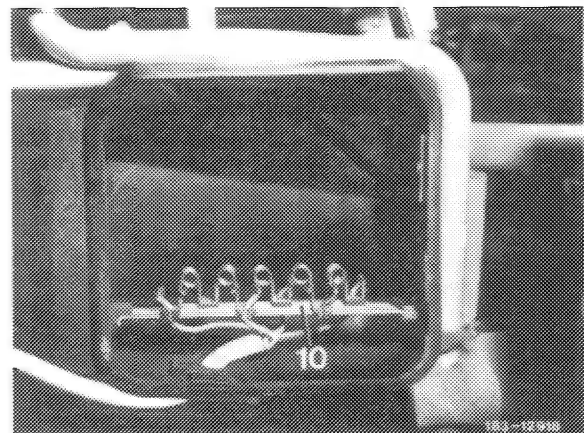


#### f) Resistor group for blower

The resistor group has 5 resistors with ohmic values of different size (refer to wiring diagrams 83–605). Group is installed in evaporator housing in front of evaporator.

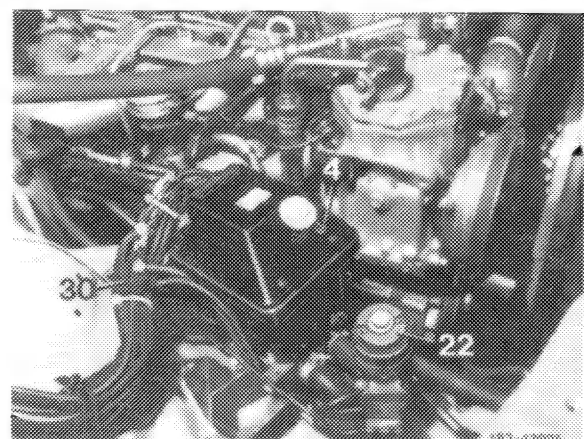
Layout of pre-resistor group

- 10 Pre-resistor

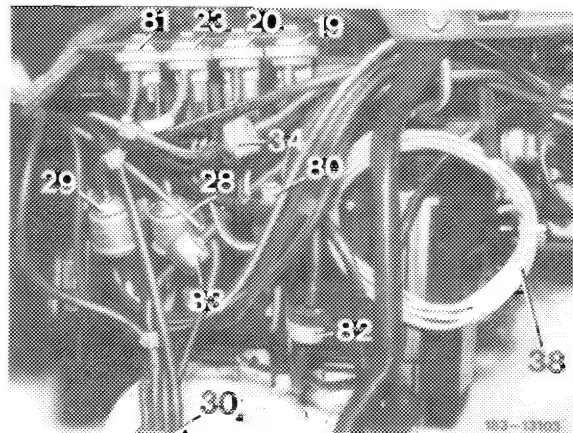


#### g) Heating water pump

The heating water pump (22) is located adjacent to regulating valve (4) and serves for maintaining a uniform heating water flow through heat exchanger also at low engine speeds. The heating water pump (22) will be energized only if the vacuum solenoid switch (20) for refrigerant compressor is closed. In position "OFF" or at an ambient temperature above  $26^{\circ}\text{C}$  ( $79^{\circ}\text{F}$ ) the heating water pump is switched off by the temperature switch (21).

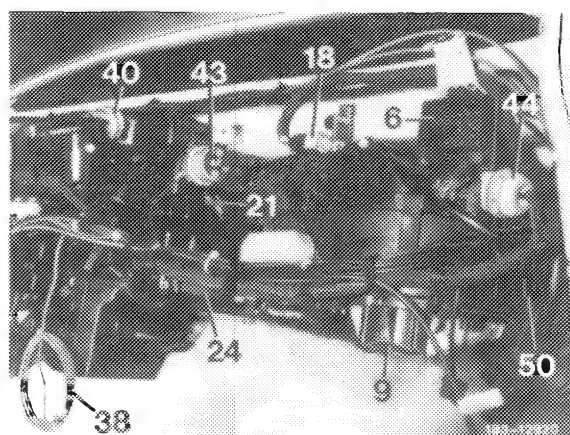


- 19 Vacuum switch (main switch, green)
- 20 Vacuum switch (refrigerant compressor, yellow)
- 23 Vacuum switch for refrigerant compressor (at "BI-LEVEL" only)
- 28 Switchover valve legroom flaps
- 29 Switchover valve (fresh air-recirculating air flap)
- 34 Check valve
- 38 Specified leak point
- 80 Switchover valve "BI-LEVEL" (at "DEF")
- 81 Vacuum switch (at "BI-LEVEL" only)
- 82 Check valve
- 83 Check valve



#### Layout blower with amplifier

- |  |  |
|--|--|
| 6 Amplifier                                  | 40 Vacuum element center jet                       |
| 9 Blower                                     | 43 Vacuum element main air flap                    |
| 18 Double contact relay                      | 44 Vacuum element fresh air-recirculating air flap |
| 21 Temperature switch for heating water pump | 50 Air jet nozzle                                  |
| 38 Specified leak point                      |  |

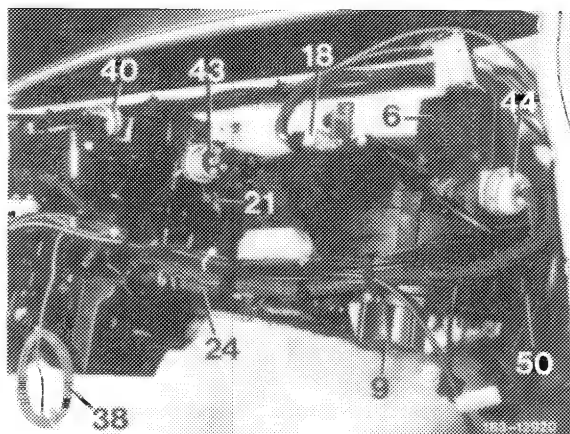


#### h) Double contact relay

During mode "DEF" and in the event of a malfunction of vacuum supply, the double contact relay (18) will bridge the main switch (19) and thereby permit defrosting of windows as well as heating as an emergency operation.

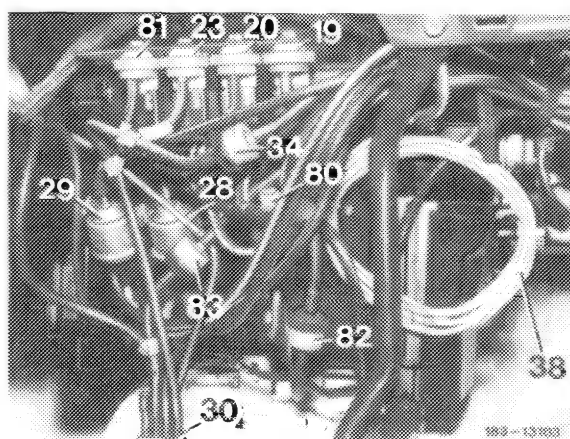
#### Layout blower with amplifier

- |  |  |
|--|--|
| 6 Amplifier                                  | 40 Vacuum element center jet                       |
| 9 Blower                                     | 43 Vacuum element main air flap                    |
| 18 Double contact relay                      | 44 Vacuum element fresh air-recirculating air flap |
| 21 Temperature switch for heating water pump | 50 Air jet nozzle                                  |
| 38 Specified leak point                      |  |



#### i) Vacuum-actuated "BI-LEVEL" switch

During "BI-LEVEL" function this switch (23) will short the circuit if the "ON/OFF" switch of the refrigerant compressor (3) is in "OFF" position. As a result, the refrigerant compressor (27) will therefore always run along in these modes to dehumidify the air except when it is switched off via temperature switch (24).

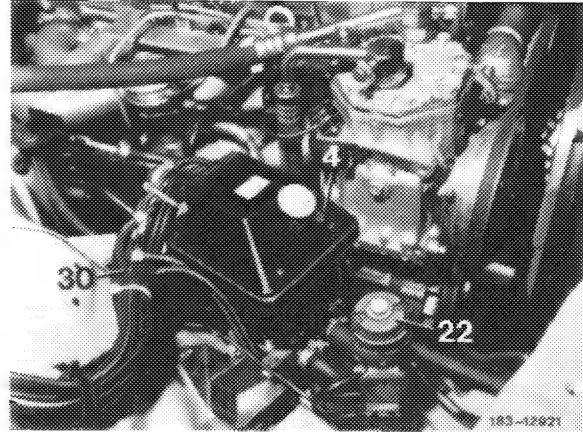


#### j) Vacuum lines

For the entire vacuum system the vacuum lines (30) are designed in such a manner (color-coded or hose lines vulcanized into couplings) that mistakes are hardly possible.

Layout regulating valve with heating water pump

- 4 Regulating valve
- 22 Heating water pump
- 30 Vacuum lines

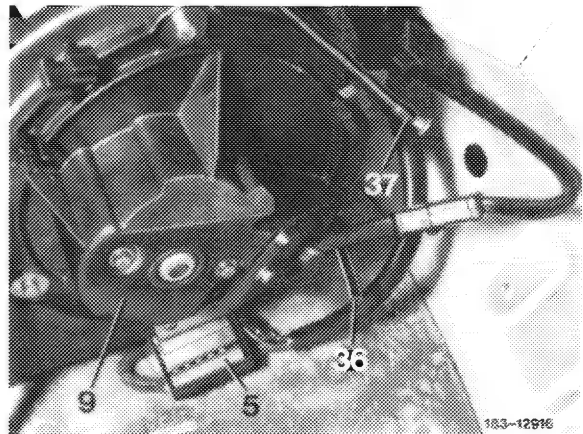


#### k) Connection for tester

For connection of tester to system a 10-point plug connection (5) is located underneath instrument panel at the right. The electrical connection and the vacuum connection (37) are accessible upon removal of righthand lower panelling.

Layout 10-point plug connection for tester

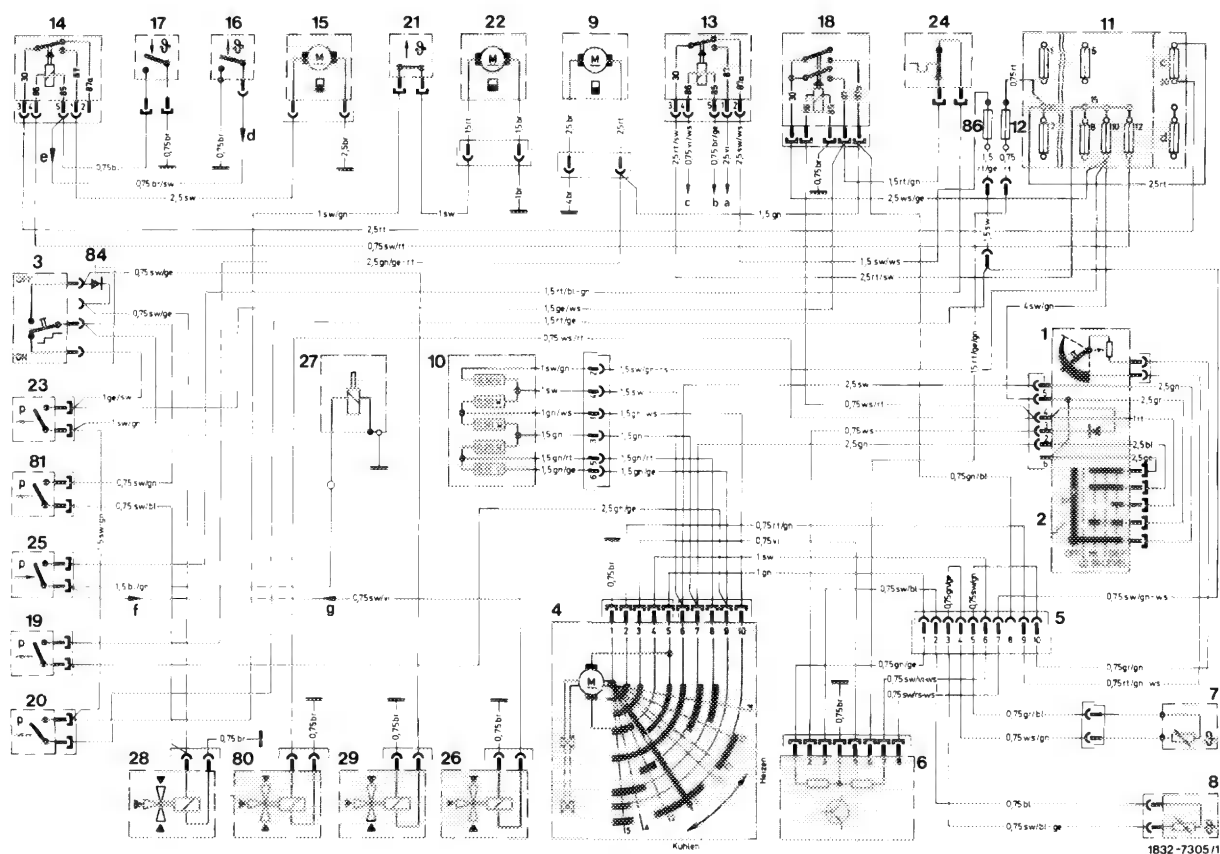
- 5 10-point plug connection for tester
- 9 Blower
- 36 Vent line for legroom flaps
- 37 Vacuum connection for tester



### G. Temperature control

The in-car temperature sensor (7) and the ambient temperature sensor (8) are temperature-sensitive resistors (thermistors) and are connected in series with potentiometer of temperature dial (1) and feedback potentiometer in regulating valve (4) (refer to electric wiring diagrams 83-600/17). This resistor chain is compared with a fixed resistor in amplifier (6). Any deviations result in a difference in potential which is amplified by the amplifier (6) and drives the servomotor in regulating valve. The regulating valve will then keep changing its position until the resistor chain is again in balance under influence of feedback potentiometer. At this moment the potential difference = 0. The amplifier is not transmitting any more voltage to servomotor in regulating valve.

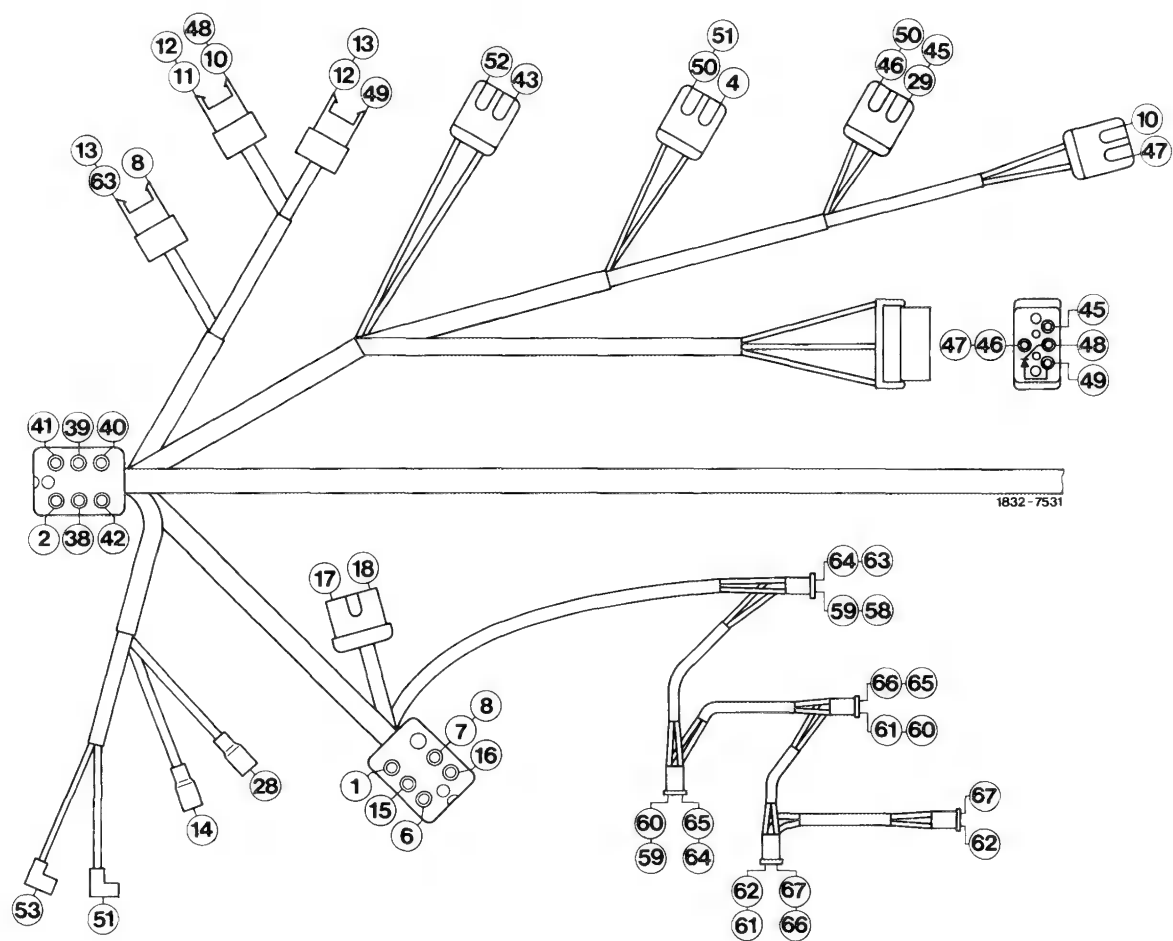




Electric wiring diagram, ignition off, regulating valve in position "parking" (standard)

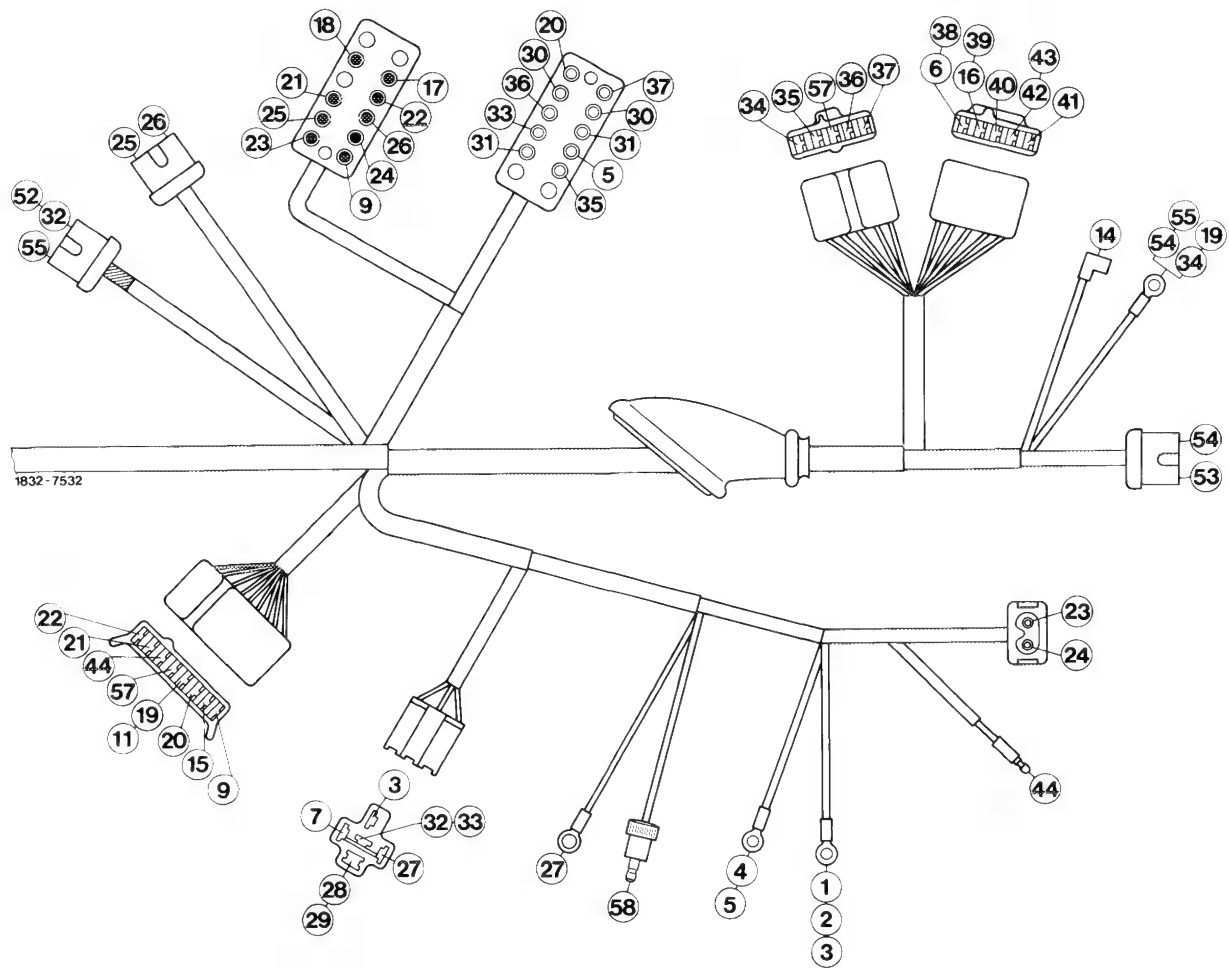
- 1 Temperature dial
- 2 Pushbutton switch
- 3 "ON/OFF" switch refrigerant compressor
- 4 Regulating valve
- 5 10-point plug connection for tester
- 6 Amplifier
- 7 In-car temperature sensor
- 8 Ambient temperature sensor
- 9 Blower
- 10 Pre-resistance for blower
- 11 Main fuse box  
Fuse 10 : 16 amps  
Fuse 12 : 8 amps  
Fuse C : 16 amps
- 12 Additional fuse for amplifier (2 amps)
- 13 Relay air conditioning system
- 14 Relay auxiliary fan
- 15 Auxiliary fan
- 16 Temperature switch 100 °C (212 °F)  
in thermostat housing for auxiliary fan
- 17 Temperature switch 62 °C (142 °F)  
in receiver dehydrator for auxiliary fan
- 18 Double contact relay
- 19 Vacuum switch  
(main switch, closes with vacuum higher than  
175 mbar or 0.18 atu)
- 20 Vacuum switch (refrigerant compressor, closes with  
vacuum higher than 78.5 mbar or 0.08 atu)
- 21 Temperature switch for heating water pump (22)  
16 °C (61 °F) ON, 26 °C (79 °F) OFF
- 22 Heating water pump
- 23 Vacuum switch (for refrigerant compressor, closes  
with vacuum higher than 78.5 mbar or 0.08 atu,  
at "BI-LEVEL" only)
- 24 ETR-switch 2 °C (36 °F)
- 25 Pressure switch refrigerant compressor  
ON 2.6 bar gauge pressure (2.6 atu)  
OFF 2.0 bar gauge pressure (2.0 atu)
- 26 Switchover valve for constant speed (engine 110.984 only)
- 27 Electromagnetic clutch for refrigerant compressor
- 28 Switchover valve for vacuum element of legroom flaps
- 29 Switchover valve for vacuum element of fresh  
air-recirculating air changeover switch
- 80 Switchover valve "BI-LEVEL" (at "DEF")
- 81 Vacuum switch (closes with vacuum higher than  
78.5 mbar or 0.08 atu, at "BI-LEVEL" only)
- 84 Diode
- 86 Additional fuse (5 amps) for heating water pump,  
refrigerant compressor and amplifier  
a Cable connector starter terminal 50  
b Starter lockout and back-up lamp switch  
c Ignition starter switch terminal 50

Additional electric harness





**Additional electric harness (continued)**



## Color code of additional harness

Line No.	Electric line from	to	Basic color	Color code	Cross section mm <sup>2</sup>
1	Fuse box terminal 15, fuse 10	Pushbutton switch terminal 5	sw	gn	4
2	Fuse box terminal 15, fuse 10	Resistor group terminal 2	sw	gn/rs	1.5
3	Fuse box, terminal 15, fuse 10	Double contact relay terminal 30	ws	ge	2.5
4	Fuse box terminal 15, fuse 5 or 86	Vacuum switch compressor	rt	ge	1.5
5	Fuse box terminal 15, fuse 5 or 86	Coupler tester terminal 7	sw	gn/ws	0.75
6	Pushbutton switch terminal 1	Regulating valve terminal 6	sw	—	2.5
7	Pushbutton switch terminal 4	Double contact relay terminal 86	ws	rt	0.75
9	Amplifier terminal 1	Plug tester	gn	ge	0.75
10	Vacuum switch "BI-LEVEL"	Switchover valve legroom flap	br	—	0.75
11	Switchover valve legroom flap	Ground	br	—	0.75
12	Switchover valve legroom flap	Switchover valve fresh air flap	br	—	0.75
13	Switchover valve fresh air flap	Switchover valve "BI-LEVEL"	br	—	0.75
14	ETR-switch	Pressure switch compressor	rt	bl/gn	1.5
15	Pushbutton switch terminal 3	Amplifier terminal 2	ws	—	0.75
16	Pushbutton switch terminal 2	Regulating valve terminal 7	gn	—	2.5
17	Temperature dial	Plug tester terminal 9	rt	gn/ws	0.75
18	Temperature dial	Plug tester terminal 10	gr	gn	0.75
19	Amplifier terminal 4	Ground	br	—	0.75
20	Amplifier terminal 3	Coupler tester terminal 2	sw	bl	0.75
21	Amplifier terminal 7	Plug tester terminal 6	sw	vi/ws	0.75
22	Amplifier terminal 8	Plug tester terminal 7	sw	rs/ws	0.75
23	Ambient temp sensor	Plug tester terminal 2	bl	—	0.75
24	Ambient temp sensor	Plug tester terminal 3	sw	bl/ge	0.75
25	In-car temp sensor	Plug tester	ws	gn	0.75
26	In-car temp sensor	Plug tester terminal 5	gr	bl	0.75
27	Double contact relay	Ground	br	—	0.75
28	Double contact relay terminal 87	ETR-switch	rt	gn	1.5
29	Double contact relay terminal 87	Vacuum switch refrigerant compressor ("BI-LEVEL")	ge	ws	1.5
30	Coupler tester terminal 3	Coupler tester terminal 4	gn	ge	0.75
31	Coupler tester terminal 5	Coupler tester terminal 10	sw	gn	0.75
32	Double contact relay terminal 87 b	Blower	gn	—	1.5
33	Double contact relay terminal 87 b	Coupler tester terminal 8	gn	bl	0.75
34	Ground	Regulating valve terminal 1	br	—	0.75
35	Coupler tester terminal 9	Regulating valve terminal 2	rt	gn	0.75
36	Coupler tester terminal 6	Regulating valve terminal 4	sw	—	1.0
37	Coupler tester terminal 1	Regulating valve terminal 5	gn	—	1.0
38	Resistor group terminal 4	Regulating valve terminal 6	sw	—	1.5
39	Resistor group terminal 3	Regulating valve terminal 7	gn	—	1.5
40	Resistor group terminal 5	Regulating valve terminal 8	gn	rt	1.5
41	Resistor group terminal 1	Regulating valve terminal 10	gn	ws	1.5

**Color code:** bl = blue, br = brown, ge = yellow, gn = green, gr = grey, rt = red, sw = black, vi = purple, ws = white

**Color code of additional harness (continued)**

Line No.	Electric line from	to	Basic color	Color code	Cross section mm <sup>2</sup>
42	Resistor group terminal 6	Regulating valve terminal 9	gn	ge	1.5
43	Vacuum switch (main switch)	Regulating valve terminal 9	gn	ge	2.5
44	Additional fuse terminal 30	Amplifier terminal 6	rt	ge/gn	1.5
45	"ON/OFF" switch compressor	Vacuum switch refrigerant compressor ("BI-LEVEL")	ge	sw	1.0
46	"ON/OFF" switch compressor	Vacuum switch refrigerant compressor ("BI-LEVEL")	sw	gn	1.0
47	"ON/OFF" switch compressor	Switchover valve legroom flap	sw	ge	0.75
48	"ON/OFF" switch compressor	Switchover valve legroom flap	sw	ge	0.75
49	"ON/OFF" switch compressor	Switchover valve fresh air flap	sw	ge	0.75
50	Vacuum switch refrigerant compressor ("BI-LEVEL")	Vacuum switch compressor	sw	gn	1.5
51	Vacuum switch compressor	Temperature switch for heating water pump	sw	gn	1.0
52	Vacuum switch (main switch)	Blower	gn	ge/rt	2.5
53	Heating water pump	Temperature switch for heating water pump	sw	—	1.0
54	Heating water pump	Ground	br	—	1.0
55	Blower	Ground	br	—	4.0
57	Amplifier terminal 5	Regulating valve terminal 3	vi	—	0.75
58	Coupler single terminal 58 d	Lights — actuation +	gr	bl	0.5
59–62	Lights — actuation +	Lights — actuation +	gr	bl	0.5
63	Ground	Lights — actuation —	br	—	0.5
64–67	Lights — actuation —	Lights — actuation —	br	—	0.5

**Color code**

bl = blue  
 br = brown  
 ge = yellow  
 gn = green  
 gr = grey  
 rt = red  
 sw = black  
 vi = purple  
 ws = white

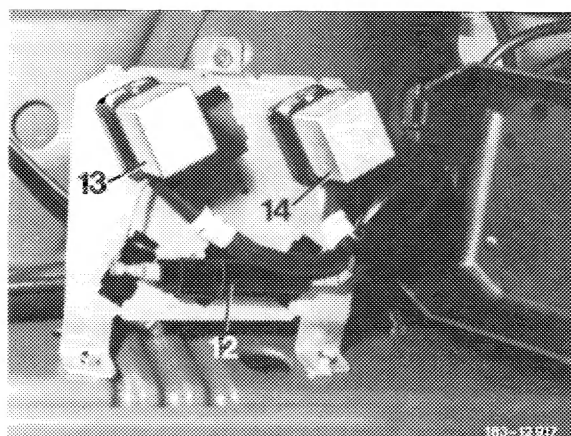
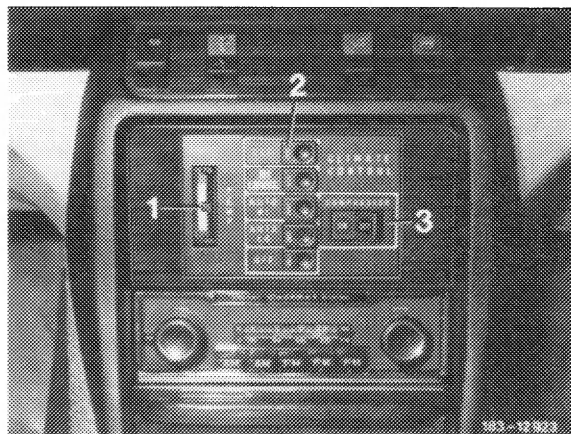
### Example:

If the temperature dial (1) is set higher for a few degrees, the resistance of the potentiometer increases and thereby that of the entire resistor chain. A comparison with the fixed resistance results in a difference in potential which, upon amplification, drives the servomotor. The regulating valve will run in direction of "heating" until the chain and the fixed resistor are again in balance. The vehicle will heat up, the in-car temperature sensor will then become a few degrees warmer, its resistance will drop. Another difference in potential in amplifier will result, this time a negative one. In amplified condition it will drive the servomotor in regulating valve in reverse until the system is again in balance and the preset temperature is attained.

When the ignition is switched off, the regulating valve moves into a parking position. The amplifier receives a direct electrical signal from battery (fuse 12). The amplifier will then make sure that the regulating valve moves into parking position (blower stage 2 — cooling). When the specified setting is attained, the valve will automatically switch off.

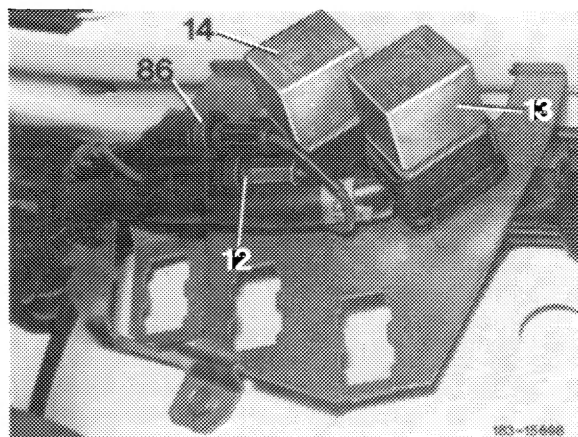
Layout additional fuse for amplifier and relay (USA)

- 12 Additional fuse for amplifier
- 13 Relay air conditioning system/starter (code number 12)
- 14 Relay auxiliary fan (code number 6)



Layout additional fuse for amplifier and relay (Europe)

- 12 Additional fuse for amplifier
- 13 Relay air conditioner/starter (code number 12)
- 14 Relay auxiliary fan (code number 6)
- 86 Additional fuse for heating water pump, refrigerant compressor and amplifier



## H. Tester

### Conventional tool

1 tester ATC 331

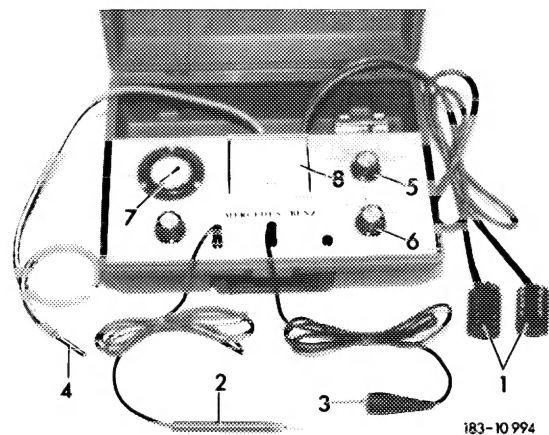
made by Deutsche Ranco GmbH  
Postfach 1560  
6832 Hockenheim

The tester is an auxiliary tool which puts artificial operating conditions into the automatic temperature control system for all its modes, from blower max. cooling to blower max. heating, without any regard to weather conditions.

When the tester is connected to the system, the ambient temperature sensor, the in-car temperature sensor and the temperature dial are bypassed by the tester. The bypass circuit takes the place of electrical signals as an input into the amplifier section to switch the system through its steps.

The vacuum measuring instrument (7) shows the vacuum in the system supplied to the main switch. The instrument shows when a flap changes its position by slight and fast descending and ascending (fluctuations) on vacuum readout.

- |                               |                               |
|-------------------------------|-------------------------------|
| 1 10-point plug connection    | 5 Voltmeter switch            |
| 2 Volt or ohmmeter needle     | 6 Mode switch                 |
| 3 Connection (vehicle ground) | 7 Vacuum measuring instrument |
| 4 Vacuum connection line      | 8 Voltmeter                   |



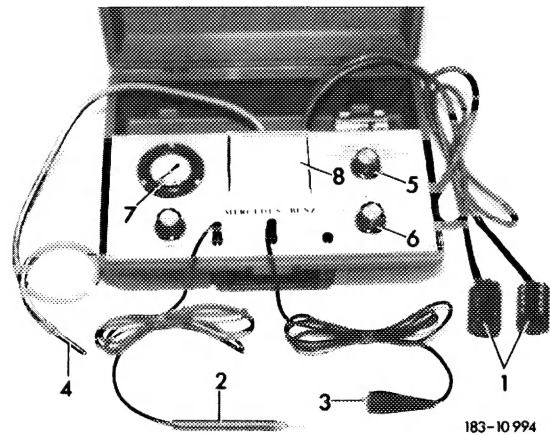
Voltmeter (8) shows changes of blower motor speeds and additionally checks the condition of the in-car and ambient temperature sensor, as well as temperature dial, amplifier and regulating valve.

A tester not used for testing should be in the "OFF" position; damage may result if the tester remains switched on.

## Control knob — positions of tester

---

- |                               |                               |
|-------------------------------|-------------------------------|
| 1 10-point plug connection    | 5 Voltmeter switch            |
| 2 Volt or ohmmeter needle     | 6 Mode switch                 |
| 3 Connection (vehicle ground) | 7 Vacuum measuring instrument |
| 4 Vacuum connection line      | 8 Voltmeter                   |



The **voltmeter switch** (5) is a switch with six positions:

### OFF position:

In this position no voltage can be read on measuring instrument. If it is not used, leave knob in its position and put back into this position in-between tests.

### BLOWER VOLTS position:

In this position, the blower motor voltage is read directly on voltmeter.

### AMBIENT SENSOR position:

In this position the voltage drop is measured via ambient temperature sensor.

### TEMPERATURE CONTROL position:

In this position the voltage drop is measured via temperature dial.

### IN-CAR SENSOR position:

In this position the voltage drop is measured via the in-car temperature sensor.

### SERVO AMP position:

In this position the amplifier output voltage to regulating valve is indicated on voltmeter.

**Mode switch (6)** is a switch with five positions:

**PARK position:**

In this position the regulating valve moves to the position indicated as parking position, which occurs each time when the ignition is switched off.

Both park positions on tester are similar to each other. When the tester is in this position, the blower remains switched on because the "OFF" knob must be pushed to bleed the main switch.

**A/C position:**

In this position the operating conditions of a hot day are fed into amplifier and the regulating valve is set to position max. "cooling".

**MID position:**

In this position the regulating valve is set to a low blower speed (not included in test program).

**HEAT position:**

In this position the operating conditions of a cold day are fed into amplifier and the regulating valve is set to max. "heating".